BOMBARDIER
Toronto Site
PROPRIETARY INFORMATION

PPS 25.52

PRODUCTION PROCESS STANDARD

BONDING USING DHMS A6.12 TYPE I ADHESIVE

Issue 14
- This standard supersedes PPS 25.52, Issue 13.
- Vertical lines in the left hand margin indicate changes over the previous issue.
- Direct PPS related questions to christie.chung@aero.bombardier.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

Prepared By:	(Christie Chung)	February 24, 2015	
	PPS Group		
Approved By:	(K. Quon, for L.K. John)	February 26, 2015	
	Materials Technology		
	(A. Assivero, for D. Dawe)	March 3, 2015	
	Quality		

TABLE OF CONTENTS

Sections **Page**

Tables

1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for bonding using DHMS A6.12 Type I adhesive.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS shall be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. do not supersede the procedure or requirements specified in this PPS. Similarly, the procedure and requirements specified in this PPS are not applicable when use of a BAPS, MPS, LES or P. Spec. is specified.

2 HAZARDOUS MATERIALS

2.1 Before receipt at Bombardier Toronto, all materials shall be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto Environment, Health and Safety Department.

3 REFERENCES

3.1 BAERD GEN-023 - Contamination Control for Compressed Air.

3.2 EMCM-001 - Bombardier Aerospace Engineering Material Control Manual.

3.3 PPS 13.13 - Personal Protective Respiratory Equipment.

3.4 PPS 13.26 - General Subcontractor Provisions.

3.5 PPS 13.28 - Storage Life of Adhesives, Sealants, Paints and Composite Products.

3.6 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

3.7 PPS 25.66 - Cleanliness Requirements for Application of Adhesives.

3.8 PPS 31.17 - Solvent Usage.

3.9 PPS 34.08 - Application of Epoxy-Polyamide Primer (F19 & F45).

4 MATERIALS, EQUIPMENT AND FACILITIES

4.1 Materials

4.1.1 DHMS A6.12 Type I adhesive.

4.1.2 Abrasive paper, aluminum oxide, 50 - 80 grit size and 120 - 180 grit size.

4.1.3 Disposable wax-free paperboard containers (e.g., Melo take-out food containers).

4.1.4 Clamps, vacuum table, platen press or masking tape.

4.1.5 Epoxy resin filler, Cab-O-Sil.

4.2 Equipment

4.2.1 Compressed air shall meet the requirements of BAERD GEN-023.

4.2.2 Weighing scales (e.g., triple beam balance type) capable of weighing to ± 0.5 grams.

4.2.3 Lint-free cotton gloves (e.g., DSC 422-1).

4.2.4 Suitable bristle brush, spatula or mohair roller.

4.3 Facilities

4.3.1 This PPS has been identified as a “Critical or Special” process according to PPS 13.39 and as such only facilities specifically approved according to PPS 13.39 are authorized to perform bonding using DHMS A6.12 Type I adhesive according to this PPS.

4.3.2 Bombardier subcontractors shall direct requests for approval to Bombardier Aerospace Supplier Quality Management. Bombardier Aerospace facilities shall direct requests for approval to the appropriate internal Quality Manager.

4.3.3 Facility approval shall be based on a facility report, a facility survey and completion of a qualification test program, if required. The facility report shall detail the materials and equipment to be used, the process sequence to be followed and the laboratory facilities used to show compliance with the requirements of this PPS. Any deviation from the procedure or requirements of this PPS shall be detailed in the facility report. Based upon the facility report, Bombardier Toronto Engineering may identify additional qualification and/or process control test requirements. During the facility survey, the facility requesting qualification shall be prepared to demonstrate their capability. Once approved, no changes to subcontractor facilities may be made without prior written approval from Bombardier Aerospace Supplier Quality Management.

4.3.3.1 For approval of subcontractor facilities to perform bonding using DHMS A6.12 Type I adhesive according to this PPS, completion of a test program and submission of suitable test samples representative of production parts is required. Test samples shall meet the requirements specified in section 6.

5 PROCEDURE

5.1 Preparation of Parts

5.1.1 Do not use protective hand cream as it may contaminate cleaned or adhesive coated surfaces. Wear clean cotton gloves when handling bonding surfaces. Do not touch or contaminate prepared surfaces with bare hands or other foreign objects.

5.1.2 Ensure the bonding surfaces of aluminum alloy parts and cadmium plated parts have been primed with F19 according to PPS 34.08.

5.1.3 Immediately before applying adhesive, prepare the bond surfaces as specified in Table I.

TABLE I - CLEANING OF BONDING SURFACES FOR ADHESIVE BONDING

MATERIAL	CLEANING PROCEDURE
All F19 primed parts	Solvent clean according to PPS 31.17.
Unprimed metal parts	Solvent clean according to PPS 31.17.
Unprimed fibreglass (including Kevlar laminates and composites)	Step 1. Lightly scuff the bonding surfaces with 120 - 180 grit abrasive paper. Step 2. Solvent clean according to PPS 31.17.
Unprimed phenolic (except Formica, Arborite, etc.)	Step 1. Lightly scuff the bonding surfaces with 120 - 180 grit abrasive paper. Step 2. Solvent clean according to PPS 31.17.
Unprimed Formica, Arborite, etc.	Solvent clean according to PPS 31.17.
Unprimed plastic parts (except Kevlar and fibreglass)	Solvent clean according to PPS 31.17.
Rubber parts (neoprene, nitrile, Buna-N, etc.)	Solvent clean according to PPS 31.17.
Rubber parts (Silicones)	Step 1. Solvent clean according to PPS 31.17. Step 2. Lightly scuff the bonding surfaces with 120 - 180 grit abrasive paper. Step 3. Solvent clean according to PPS 31.17.
Wood (except balsa)	Step 1. Sand bond surfaces with 50 - 80 grit abrasive paper. Step 2. Remove residual dust with clean compressed air.
Porous materials (Velcro, fabrics, balsa, cork, etc.)	Do not clean porous materials in any way. If the bonding surface is contaminated, refer the part to Liaison Engineering.
Rulon A	Solvent clean according to PPS 31.17.
Flexible polyurethane foam	Solvent clean according to PPS 31.17.
Rigid polyurethane foam	Step 1. Lightly scuff the bonding surfaces with 120 - 180 grit abrasive paper. Step 2. Remove residual dust with clean compressed air.

5.2 Preparation of Adhesive

5.2.1 DHMS A6.12 Type I adhesive is a two part resin/catalyst prepared as follows:

Step 1. Thoroughly stir the resin and catalyst in their separate containers.

Step 2. Weigh out the resin as specified in Table II in a disposable mixing container in even 100 gram increments or fraction thereof as required for the work on hand.

Step 3. Weigh the correct proportion of catalyst according to Table II directly in the resin container on the scale. Do not weigh the catalyst into a separate container.

Step 4. Stir the resin and catalyst to obtain a homogeneous air-free mixture. Thoroughly mixed adhesive will have a uniform medium grey colour.

5.2.2 Discard excess material upon expiration of the pot life.

TABLE II - MIXING RATIO FOR DHMS A6.12 TYPE I ADHESIVE

ADHESIVE SYSTEM	COMPONENTS	MIXING RATIO (PARTS BY WEIGHT)	POT LIFE (NOTE 1)
DHMS A6.12 (Note 2)	EC 2216-B Resin	100	90 minutes
	EC 2216-A Catalyst	140	

Note 1. The pot life is the time during which mixed adhesive remains suitable for application at 75 ± 5°F and 50% relative humidity (R.H.). Higher temperature and R.H. will shorten the pot life.
Note 2. Cab-O-Sil epoxy resin filler, up to 2% by weight, may be added to DHMS A6.12 Type I adhesive when mixing.

5.3 Bonding

5.3.1 Perform bonding in a clean area according to PPS 25.66.

5.3.2 When bonding to Kevlar laminates or composites, ensure the bonding area is free of F33.

5.3.3 Bond as follows:

Step 1. Apply a thin, uniform coat of adhesive to both bonding surfaces using a suitable bristle brush, spatula or mohair roller.

Step 2. Assemble the parts in the correct alignment and apply pressure using clamps, vacuum table, platen press or masking tape to ensure intimate contact over the full bonding area. If the assembly manual specifies that fasteners are to be installed in bonded parts at the time of bonding, position the parts with Cleco temporary fasteners and install permanent fasteners before expiry of the pot life of the adhesive.

Step 3. Allow the bond to cure for a minimum of 72 hours at room temperature (65°F minimum) or 4 hours at 120°F ± 5°F (50°C ± 2°C) before handling or installing the assembly in the aircraft. If the accelerated cure is used, record the date, time and oven temperature on the work order adjacent to the operation. If fasteners have been installed during the pot life of the adhesive and have immobilized the bond, the assembly may be handled before the entire cure time has elapsed.

5.4 Clean-Up

5.4.1 Remove adhesive from tools and equipment by solvent cleaning according to PPS 31.17.

6 REQUIREMENTS

6.1 Bonded parts and assemblies shall have intimate contact over the full bonding area.

6.2 Visual indication of poor adhesion is not acceptable.

6.3 Allow bonds to cure for a minimum of 72 hours at room temperature (65°F minimum) or 4 hours at 120°F ± 5°F (50°C ± 2°C) before being further worked or installed in the aircraft.

6.4 Receipt inspection requirements of DHMS A6.12 Type I adhesive shall be as specified in EMCM-001.

7 SAFETY PRECAUTIONS

7.1 Observe standard plant safety precautions when performing the procedure specified herein.

7.2 Refer to PPS 31.17 for the safety precautions for handling and using solvents.

7.3 Keep adhesive away from fire and other sources of ignition.

7.4 Wear protective respiratory equipment according to PPS 13.13 when working with adhesive.

7.5 Ensure sufficient ventilation is supplied at all times when using adhesive. Avoid inhalation of fumes or vapours from adhesive.

7.6 Avoid eye contact with adhesive. If eye contact occurs, immediately flush eyes in a directed stream of water for at least 15 minutes while forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissue. Contact the Health Centre and a physician.

7.7 Avoid skin contact with adhesive. If skin contact occurs, wash the affected area immediately with soap and water. If irritation of the skin occurs, contact the Health Centre immediately.

7.8 Wash hands thoroughly with soap and water immediately after using adhesive.

8 PERSONNEL REQUIREMENTS

8.1 This PPS has been categorized as a “Critical or Special Process” according to PPS 13.39. Refer to PPS 13.39 for personnel requirements.

9 STORAGE OF ADHESIVE

9.1 Store DHMS A6.12 Type I adhesive according to the precautions necessary for flammable materials at a temperature of 60°F to 80°F (16°C to 26°C).

9.2 The storage life of the adhesive shall be as specified in PPS 13.28.

9.3 Always use oldest stock first (i.e., first in/first out (FIFO) basis).

9.4 Ensure adhesive containers are clearly marked with the storage life expiry date.

9.5 Keep adhesive containers tightly closed when not in use.